California Division of Mines and Geology

Fault Evaluation Report FER-11

August 6, 1976

1. Names of faults: North Frazier Mountain thrust, South Frazier Mountain thrust, Dry Creek thrust, and related faults.

2. Location of faults: Frazier Mountain, Cuddy Valley, McDonald Peak, add Lockwood Valley quadrangles, Ventura County.

3. Reason for evaluation: Part of a 10-year program; zoned in Ventura County's Seismic and Safety Element (Nichols, 1974).

4. List of references:

a) Burnett, J.L., 1960, The geology of the southern portion of Frazier Mountain near Gorman, California: unpublished M.S. thesis (mining) University of California, Berkeley, scale 1:31,680.

b) California Division of Mines and Geology, 1976, Active fault mapping and evaluation program, 10-year program to implement Alquist-Priolo Special Studies Zones Act: California Division of Mines and Geology, Special Publication 47, 42 p.

c) Carman, M.F., Jr., 1964, Geology of the Lockwood Valley area: California Division of Mines and Geology, Special Report 81, 62 p., 4 pl. (scale 1" = 875').

d) Crowell, J.C., 1950, Geology of Hungry Valley area, southern California: Bulletin American Association of Petroleum Geologists, v. 34, no. 8, p. 1623-1646, map scale approximately 1" = 3/4 mile.

e) Crowell, J.C., 1964, The San Andreas fault zone from the Temblor Mountains to Antelope Valley, southern California in Pacific Section A.A.P.G. - S.E.P.M. and San Joaquin Geological Society Guidebook, p. 8-38, pl. 1, map scale 1:62,500.

Note: Plate 1 has no topographic control.

f) Crowell, J.C., 1968, Movement of faults in the Transverse Ranges and speculations on the tectonic history of California in Proceedings of conference on geologic problems of San Andreas Fault System, Dickinson, W.R., and Grantz, A., editors: Stanford University Publications, Geological Sciences, v. XI, p. 323-341.

g) Dibblee, T.W., Jr., 1949, Unpublished geologic mapping of the Hines Peak quadrangle, scale 1:62,500. Remarks: No topo on base map, no roads -- streams only.

h) Eaton, J.E., 1939, Ridge Basin, California: Bulletin American Association of Petroleum Geologists, v. 23, no. 4, p. 517-558, map scale 1" = 2.5 miles.

i) Jennings, C.W., and Strand, R.G., 1969, Geologic map of California, Los Angeles Sheet: California Division of Mines and Geology, scale 1:250,000.

j) Jennings, C.W., 1975, Fault map of California with locations of volcanoes, thermal springs, and thermal wells: California Division of Mines and Geology, California Geologic Data Map Series, Map no. 1, scale 1:750,000.

k) Nichols, D.R., 1974, Surface faulting: in Seismic and Safety Elements of the Resources Plan and Program, Ventura County Planning Department, section II, p. 1-35, pl. 1.

1) Weber, F.H., Jr., Kiessling, E.W., Sprotte, E.C., Johnson, J.A., Sherburne, R.W., and Cleveland, G.B., 1975 (Preliminary draft of 2/27/76), Seismic hazards study of Ventura County, California: California Division of Mines and Geology, open file report 76-5LA.

5. Summary of available data:

All the faults referred to (see figure 1) were zoned in the Ventura County Seismic and Safety Elements as secondary fault hazards (Nichols, 1974). Essentially all faults shown by Jennings and Strand (1969) are zoned in the Element, apparently without consideration as to recency of activity. I assume that no attempt was made by Nichols to determine which faults were active, recently active, or inactive -- hence all were zoned in the Element.

Jennings (1975) classifies the Frazier Mountain and Dry Creek thrusts as Quaternary (see figure 1a) based on Crowell (1950, p. 1644-45; 1964, p. 14; and 1968, p. 327). In each of his works, Crowell indicates that the Frazier Mountain thrust was active primarily during the Pleistocene. I assume he was referring to both the North and South Frazier Mountain thrusts which may have once been a single fault. Crowell (1950) indicated that the Dry Creek thrust was active during the Pleistocene, also. However, Crowell (1964) states that the Frazier Mountain thrust system (North Frazier Mountain, South Frazier Mountain thrusts and perhaps the Dry Creek thrust) "apparently died during the mid-Pleistocene." Crowell (1950) states that the Frazier Mountain thrust "lies beneath alluvium and terrace material". Crowell (1964) portrays both the North and South Frazier Mountain thrusts and the Dry Creek thrust as buried under late Quaternary terrace deposits (see figure 2).

Burnett (1960) also shows the North Frazier Mountain, South Frazier Mountain, and Dry Creek thrusts as buried under Pleistocene terrace deposits. Burnett states (p. 28) "The fault does not appear to displace the high terrace deposits which are presumably of Pleistocene age."

There is no evidence that any of the unnamed faults shown by Crowell (1964) (see figure 2) in the upper plate of the Frazier Mountain thrust were active since the Pleistocene. The terrace deposits over these faults are unfaulted.

Carmen (1964) shows Pleistocene units to be cut by five minor faults (two of which cross each other) (see figure 3). He depicts all the other faults as not cutting various Pleistocene units. Of the five unnamed faults (labeled A, B, C, D, & E on figure 3), faults C and D are shown as both buried under and cutting terrace deposits (late Pleistocene to early Recent). I assume that the depositional contacts are so close to the faults that the depositional contact symbol was omitted. Faults A, B, and E are shown as cutting Frazier Mountain Formation (mid-Pleistocene) while not cutting terrace deposits.

Eaton (1939, p. 552) describes the Frazier Mountain "slab" in general terms, and concludes that the Frazier Mountain thrust (mapped as a single fault) was active during middle to late Pleistocene time.

Dibblee (1949) depicts a segment of the fault as buried under Qfg (Pleistocene) in one location and perhaps overriding Qfg in another (see figure 4). (All other authors depict the fault as buried under terrace deposits at this second location, and I favor the latter interpretation.)

Weber, et al. (1975, p. 178) states of the North and South Frazier Mountain and the Dry Creek thrusts "These faults, at least in part, may

represent 'dead' thrusts -- partly of gravity origin?; or, if alive, they should be judged potentially active." The stated age for these faults is Quaternary. Plate 6 of Weber, et al. shows the faults to be Plio-Pleistocene, and a late Quaternary(?) designation is also noted near faults A and B (see figure 3).

6. Interpretation of air photos: U-2 air photos, flight 73-194, numbers 6386-6387 and 6443-6445 (scale 1:125,000) were viewed stereo-optically. Based on the high elevation and rugged relief, recent uplift apparently occurred. Although this uplift may have been associated with faulting, no small scale fault-related features were observed that would indicate Holocene activity along any of the mapped faults. Undoubtedly, some persons might interpret the large amount of relief as in indication of late Quaternary movement, primarily along the North and South Frazier Mountain thrusts. However, such presumed activity cannot be associated with specific fault traces based on the U-2 photos examined.

7. Field observations: On June 2, 1976 I made observations in the vicinity of Chuchupate Campground (noted in pink on figure 5a and 5B), where Carmen shows a concealed, northeast-trending fault. No fault features (scarps, etc.) were observed along this trace in any of Carmen's Quaternary units. Even in bedrock at the southern most point examined, the fault was indistinct and could not be followed on the ground.

On June 3, 1976, I made observations in section 18, T. 8 N., R. 20, W., SBB&M (figure 5a). The bedrock (Pliocene and Miocene ages) was faulted in two locations (indicated by purple arrows on figure 4a). However, no scarps or other features indicative of recent faulting were observed in the bedrock, the terrace deposits, or the Quaternary alluvium along the extension of either of these faults or any along the

nearby faults (noted by blue arrows at the points where observations were made), including fault A (of figure 3).

8. Conclusions: As noted in items 5, 6, and 7, no evidence of Holocene fault activity is apparent along either the North Frazier Mountain, South Frazier Mountain, or Dry Creek thrust faults, or any of the unnamed faults examined or discussed. Some faulting reportedly did occur during the Quaternary, perhaps as recent as the late Quaternary, along some of these faults.

9. Recommendations: Under present guidelines (reference "b", p. 19, 28-32), it is recommended that none of these faults be zoned.

10. Investigating geologist's name, date:

Theodore C. Smith

THEODORE C. SMITH
Geologist
August ~~25~~ 6, 1976

NOTE: I concur, not enough evidence to warrant zoning.

Earl W. Hart

EARL W. HART
Geologist
~~August 6~~, 1976
Sept. 14,

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Fig 4.
(from Dibblee, 1949)